IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF

Applicants:	Yin L. Cheung, Michael J. Zeitlin, and Mark Acosta	**Attorney Docket No.:**	33849-8
Serial No.:	10/806,980	**Art Unit:**	2628
Filed:	March 22, 2004	**Conf. No.:**	2205
For:	System and method for analyzing and imaging three-dimensional volume data sets using a three-dimensional sampling probe	**Examiner:**	Phu K. Nguyen

APPELLANT'S BRIEF

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

This brief is submitted in support of the appeal from the final rejection of U.S. Patent Application Serial Number 10/806,980 (the "'980 Application"). On April 9, 2008 a Notice of Appeal and a Pre-Brief Conference request were filed. On May 27, 2008, a Pre-Appeal Brief Conference decision was mailed deferring the decision to the Board of Patent Appeal and Interferences. A Petition for Extension of Time was timely filed before each deadline thus, extending the deadline to file this brief by five months. Pursuant to MPEP 1205.02, only one copy of the appeal brief is transmitted.

The Commissioner is hereby authorized to charge the fee for filing a brief in support of an appeal under 37 CFR §41.20(b)(2) and any required fees associated with any necessary petition for extension under 37 CFR §1.17 and any other amount required, or credit any overpayment, to Deposit Account No. 50,3385.

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REAL PARTY IN INTEREST

The real party in interest is Landmark Graphics Corporation, a Halliburton Company, which is the assignee of record and a subsidiary of Halliburton Energy Services, Inc.

RELATED APPEALS AND INTERFERENCES

An appeal was filed on December 2, 2002 during the prosecution of U.S. Patent Application No. 09/119,635 (the '635 Application"), which is the parent of the '980 Application. The appeal was terminated when the Examiner reopened the prosecution. U.S. Patent No. 6,765,570 issued as a result of the claims that were allowed in the '635 Application. There are no other prior or pending appeals, interferences or judicial proceedings known to Appellant, the Appellant's' legal representative, or assignee, which may be related to, directly affect, be directly affected by, or have a bearing on the Board's decision in the pending appeal.

STATUS OF CLAIMS

On March 23, 2004, the '980 Application was filed with 26 claims as a continuation of the '635 Application.

On October 6, 2004, an Office Action was mailed rejecting claims 1-13 and 15-26, while objecting to claim 14.

On November 3, 2004, a telephonic interview was conducted with the Examiner.

On January 6, 2005, Applicants filed their Amendment and Response to Office Action Dated October 6, 2004, which included a terminal disclaimer. Claims 27-52 were added.

On September 14, 2005, a personal interview was conducted with the Examiner. Although an agreement was not reached during the interview, a Notice of Allowability was mailed for claims 1-26 on June 5, 2006.

On June 12, 2006, a telephonic interview was conducted with the Examiner and an agreement was reached with respect to claims 27-52.

On June 14, 2006, a Supplemental Notice of Allowability was mailed for claims 1-52.

On September 5, 2006, Applicants filed a Request for Continued Examination and a Fifth Information Disclosure Statement.

On January 5, 2007, an Office Action was mailed rejecting claims 1-52. As part of the rejection, the Examiner relied on various pages of a VoxelGeo 1.1.1 Productivity Tool for Geosciences manual (hereinafter "*Holden*"), which was filed with Applicants' Fifth Information Disclosure Statement.

On April 11, 2007, the entire *Holden* manual was filed at the request of the Examiner as part of Applicants' Sixth Supplemental Information Disclosure Statement.

On May 25, 2007, Applicants' representatives conducted an in-person interview with the Examiner concerning the differences between *Holden* and claims 1-52. During the interview, an agreement was reached that the "103(a) rejections will be withdrawn if the claims are amended to show meaning of the claimed 'real-time,' *e.g.*, 'sufficiently fast to be perceived in real-time as a 3D probe is moved,' or 'substantially at the same time as the 3D sampling probe is moved.'" The Examiner further agreed to withdraw the rejections and allow the claims if a further search did not yield any other related reference.

On June 29, 2007, Applicants filed an Amendment and Response to Office Action Dated January 5, 2007, which addressed all of the rejections and amended the claims (1, 21, 24, 27, 47 and 50) as requested by the Examiner.

Despite the agreement reached with the Examiner during the interview, the Examiner mailed a Final Office Action on October 9, 2007, which rejected claims 1-52 under Section 103(a) as being unpatentable over the same reference (*Holden*).

At this time, claims 1-52 stand finally rejected and are the subject of this appeal brief. No claim has been allowed.

STATUS OF AMENDMENTS

No amendments were filed subsequent to the Final Office Action on October 9, 2007.

SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 1 defines a program storage device readable by a machine embodying a program of instructions executable by the machine to perform method steps of imaging a three-dimensional (3D) volume using one or more 3D sampling probe. '980 Application at para. [0010]. The steps include creating one or more three-dimensional (3D) sampling probe(s), wherein each 3D sampling probe is a sub-volume of the 3D volume; drawing an image of the 3D sampling probe(s), the image comprising an intersection of the 3D sampling probe(s) and the 3D volume; and repeating the drawing step responsive to movement of the 3D sampling probe(s) within the 3D volume so that as the 3D sampling probe(s) moves through the 3D volume, the image of the 3D sampling probe(s) is redrawn substantially at the same time as the 3D sampling probe is moved. '980 Application at para. [0010], [0017], [0022] and Fig. 15.

Independent claim 21 defines a program storage device readable by a machine embodying a program of instructions executable by the machine to perform method steps of imaging a three-dimensional (3D) volume using a 3D sampling probe. '980 Application at para. [0010]. The steps include creating a three-dimensional (3D) sampling probe, wherein the 3D sampling probe is a sub-volume of the 3D volume; drawing an image of at least one of the 3D sampling probe and the 3D volume, the image comprising an intersection of the 3D sampling probe and the 3D volume; and repeating the drawing step responsive to movement of the 3D sampling probe within the 3D volume so that as the 3D sampling probe moves through the 3D volume, the image of the 3D sampling probe is redrawn substantially at the same time as the 3D sampling probe is moved. '980 Application at para. [0010], [0017], [0022] and Fig. 15.

Independent claim 24 defines a method for imaging a three-dimensional (3D) data volume. '980 Application at para. [0014]. The steps include creating a three-dimensional (3D)

sampling probe wherein the 3D sampling probe is a sub-volume of the 3D volume; drawing an image of at least one of the 3D sampling probe and the 3D volume, the image comprising an intersection of the 3D sampling probe and the 3D volume; and repeating the drawing step responsive to movement of the 3D sampling probe within the 3D volume so that as the 3D sampling probe moves through the 3D volume, the image of the 3D sampling probe is redrawn substantially at the same time as the 3D sampling probe is moved. '980 Application at para. [0014], [0017], [0022] and Fig. 15.

Independent claim 27 defines a program storage device readable by a machine tangibly embodying a program of instructions executable by the machine to perform method steps of imaging a three-dimensional (3D) volume. '980 Application at para. [0010]. The steps include creating one or more three-dimensional (3D) sampling probe(s), wherein each 3D sampling probe is a sub-volume of the 3D volume; drawing an image of the 3D sampling probe(s), the image comprising an intersection of the 3D sampling probe(s) and the 3D volume; and repeating the drawing step responsive to movement of the 3D sampling probe(s) within the 3D volume so that as the 3D sampling probe(s) moves through the 3D volume, the image of the 3D sampling probe(s) is redrawn sufficiently fast to be perceived in real time as the 3D sampling probe is moved. '980 Application at para. [0010], [0017], [0022] and Fig. 15.

Independent claim 47 defines a program storage device readable by a machine tangibly embodying a program of instructions executable by the machine to perform method steps of imaging a three-dimensional (3D) volume. '980 Application at para. [0010]. The steps include creating a three-dimensional (3D) sampling probe, wherein the 3D sampling probe is a sub-volume of the 3D volume; drawing an image of at least one of the 3D sampling probe and the 3D volume, the image comprising an intersection of the 3D sampling probe and the 3D volume; and

repeating the drawing step responsive to movement of the 3D sampling probe within the 3D volume so that as the 3D sampling probe moves through the 3D volume, the image of the 3D sampling probe is redrawn sufficiently fast to be perceived in real time as the 3D sampling probe is moved. '980 Application at para. [0010], [0017], [0022] and Fig. 15.

Independent claim 50 defines a method for imaging a three-dimensional (3D) data volume. '980 Application at para. [0014]. The steps include creating a three-dimensional (3D) sampling probe wherein the 3D sampling probe is a sub-volume of the 3D volume; drawing an image of at least one of the 3D sampling probe and the 3D volume, the image comprising an intersection of the 3D sampling probe and the 3D volume; and repeating the drawing step responsive to movement of the 3D sampling probe within the 3D volume so that as the 3D sampling probe moves through the 3D volume, the image of the 3D sampling probe is redrawn sufficiently fast to be perceived in real time as the 3D sampling probe is moved. '980 Application at para. [0014], [0017], [0022] and Fig. 15.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The Examiner rejected independent claims 1, 21, 24, 27, 47 and 50 under 35 U.S.C. §103(a) over *Holden*. The Examiner admits that *Holden* does not teach every limitation in claims 1, 21, 24, 27, 47 and 50. The Examiner's rejection, nevertheless, relies on isolated descriptions of two features (TumbleView and GeoSeed) in *Holden* to modify *Holden* although each teach away form the claimed invention. Applicants therefore, respectfully request review and reconsideration of whether claims 1, 21, 24, 27, 47 and 50 are patentable over *Holden*.

The Examiner rejected dependent claims 3 and 29 under 35 U.S.C. §103(a) over *Holden*. The Examiner admits that *Holden* does not teach the limitations in claim 3 and 29. The Examiner's rejection relies on a vague reference to a video interface in *Holden* to modify *Holden* although it teaches away from the limitations in claims 3 and 29. Applicants therefore, respectfully request independent review and reconsideration of whether claims 3 and 29 are patentable over *Holden*.

GROUPING OF CLAIMS

With respect to the issues presented in this brief, claims 1-2, 4-28, and 20-52 stand or fall together. Claims 3 and 29, which present additional limitations, stand or fall together.

ARGUMENT

On January 5, 2007, the Examiner issued an Office Action rejecting claims 1-52. As part of the rejection, the Examiner relied on *Holden* (pp. 9-19 through 9-22) and, for certain claims, "official notice" to support a Section 103(a) rejection. Office Action, pp. 5-11. Furthermore, the Examiner requested the complete *Holden* manual. Office Action, p. 11. On April 11, 2007, the entire *Holden* manual was filed as part of Applicants' Sixth Supplemental Information Disclosure Statement.

On May 25, 2007, Applicants' representatives (William Jensen (Houston, Texas) and Chris McDonald (Washington, D.C.)) conducted an in-person interview with the Examiner concerning the differences between *Holden* and claims 1-52. During the interview, an agreement was reached that the "103(a) rejections will be withdrawn if the claims are amended to show meaning of the claimed 'real-time,' *e.g.*, 'sufficiently fast to be perceived in real-time as a 3D probe is moved,' or 'substantially at the same time as the 3D sampling probe is moved.'" Interview Summary, p. 2. The Examiner further agreed to withdraw the rejections and allow the claims if a further search did not yield any other related reference. Interview Summary, p. 2.

On June 29, 2007, Applicants addressed all of the rejections and amended the claims (1, 21, 24, 27, 47 and 50) as requested by the Examiner in Applicants' Amendment and Response to Office Action Dated January 5, 2007. Notably, Applicants would not have amended the claims but for the Examiner's agreement that the proposed amendments would overcome the rejections based on *Holden*. In fact, Applicants would not have scheduled the interview but for the understanding that the complete *Holden* reference filed with Applicants' Sixth Supplemental Information Disclosure Statement would be considered <u>before</u> the interview.

Despite the agreement reached with the Examiner during the interview, the Examiner mailed a Final Office Action on October 9, 2007, which rejected claims 1-52 under Section 103(a) as being unpatentable over the same reference (*Holden*). In short, the Examiner argues that it would have been obvious to modify *Holden* based on two features in *Holden* (TumbleView and GeoSeed).

As demonstrated herein, the Examiner's reliance on the description of TumbleView and GeoSeed is misplaced in view of the fact that these features teach away from a limitation that the Examiner admits *Holden* does not teach.

A. Obviousness Under 35 U.S.C. §103(a).

Under §103(a), a patent may not be obtained though the invention is not identically disclosed or described as set forth in §102 "if the differences between the subject matter sought to be patented and prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." Last year, the Supreme Court decided *KSR International Co. v. Teleflex, Inc.*, which reiterated the requirements for determining obviousness under Section 103 and the type of analysis required to support such a conclusion. 550 U.S. 398, 127 S.Ct. 1727 (2007). In *KSR*, the Supreme Court reiterated that the framework set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 1966 for determining obviousness remains the basis for every decision regarding obviousness. In other words, obviousness is a question of law based on underlying factual inquiries. The factual inquiries enunciated by the Supreme Court in *Graham* are:

1) Determining the scope and content of the prior art;
2) Ascertaining the differences between the claimed invention and the prior art; and
3) Resolving the level of ordinary skill in the pertinent art.

Graham, 383 U.S. at 17-18.

Once the findings of fact are articulated, an explanation to support an obviousness rejection under Section 103 is required. *KSR*, 127 S.Ct. at 1741. Rejections based on obviousness cannot be sustained by mere conclusory statements. Instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness. *Id.* (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). The reasoning may still include the traditional standard that a claimed invention may be obvious if the Examiner identifies a prior art teaching, suggestion, or motivation to make it. *Id.*

According to MPEP 2141.02, ascertaining the differences between the prior art and the claims at issue requires interpreting the claim language, and considering both the invention and the prior art references as a whole. Distilling an invention down to the "gist" or "thrust" of an invention therefore, disregards the requirement of analyzing the subject matter as a whole. *W. L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1548 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). A prior art reference must also be considered in its entirety, including portions that would lead away from the claimed invention. *W. L. Gore*, 721 F.2d at 1550.

B. Applicants' Invention And The Prior Art.

Before ascertaining the differences between the claimed invention and the prior art, a complete understanding of both is necessary.

1. The sampling probe.

The present invention is directed to a system and method for analyzing and imaging three-dimensional ("3D") volume data sets using a 3D sampling probe. '980 Application, para. [0043]. 3D volume data sets comprise "voxels" or volume elements. *Id.* Each voxel is a sample or point within a volume. *Id.* Each voxel can be expressed in the form (x, y, z, data

value) where "x, y, z" identifies the 3D location of the point within the volume and "data value" is the value of some measured or calculated attribute or physical parameter at the specified point within the volume. *Id.*

Independent claims 1, 21, 24, 27, 47 and 50 each include similar elements defining the 3D sampling probe and its functionality. Claim 1, for example, includes:

> A program storage device readable by a machine, the device tangibly embodying a program of instructions executable by the machine to perform method steps of imaging a three-dimensional (3D) volume, the method steps comprising:
>
> creating one or more three-dimensional (3D) sampling probe(s), wherein each 3D sampling probe is a sub-volume of the 3D volume;
>
> drawing an image of the 3D sampling probe(s) the image comprising an intersection of the 3D sampling probe(s) and the 3D volume; and
>
> repeating the drawing step responsive to movement of the 3D sampling probe(s) within the 3D volume so that as the 3D sampling probe(s) moves through the 3D volume, the image of the 3D sampling probe(s) is redrawn substantially at the same time as the 3D sampling probe is moved.

While the claimed sampling probe is defined as a subvolume, not all subvolumes necessarily operate as the claimed sampling probe. The last step of repeating the drawing step, for example, is illustrative. This step is responsive to movement of the 3D sampling probe within the 3D volume. Movement of the 3D sampling probe within the 3D volume is described as a change in the shape, size or location of the 3D sampling probe within the 3D volume. '980 Application, para. [0052]. As the 3D sampling probe moves through the 3D volume there is a change in the location of the 3D sampling probe within the 3D volume. *Id.* And, an image of

the 3D sampling probe is redrawn substantially at the same time as the 3D sampling probe is moved so that there is no perceivable delay or lag in the image of the 3D sampling probe as it is redrawn. *Id.*

2. Holden.

The *Holden* manual describes various features and functions for a Geoscience productivity tool called VoxelGeo. VoxelGeo, and its shortcomings, are generally described in the application with other conventional computer programs. '980 Application, para. [0006] and [0007]. In particular, such conventional programs are described with similar capabilities and disadvantages. For example, the coordinates of the selected volume may be identified through a menu command. '980 Application, para. [0007]. The image of the selected volume is then drawn and may be rotated, if desired, at that location. *Id.* However, to look at a different piece of the full 3D volume of seismic data, such as to follow a feature of interest that has been tentatively identified, the image must be interrupted, a new location or coordinates for different piece entered, and a new image redrawn containing the different piece. *Id.* The interruption in the displayed image makes it difficult to visualize any continuity between the two pieces of the full 3D volume of seismic data that have been imaged. *Id.* This impedes the ability to interpret and identify the geologic features that are inherent in the full 3D volume of seismic data. *Id.*

Holden provides a consistent description in Chapter 9 for editing a volume along a selected axis using slider bars. *Holden*, p. 9-22. In this description, *Holden* clearly states that the image of the edited subvolume is not re-rendered (redrawn) until the slider bar is released using a mouse. *Id.* The results of the edited subvolume therefore, cannot be seen until the slider bar is released and the image is re-rendered. In other words, the image of the subvolume in the rendering window reflects the edits after they are made – not as they are made.

C. The Rejection of Claims 1-2, 4-28 and 30-52 Should Be Reversed.

Independent claims 1, 21, 24, 27, 47 and 50 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Holden*. Final Office Action, p. 2.

1. *Holden* does not teach each limitation required by the independent claims.

Claim 1 requires "repeating the drawing step responsive to movement of the 3D sampling probe(s) within the 3D volume so that as the 3D sampling probe(s) moves through the 3D volume, the image of the 3D sampling probe(s) is redrawn substantially at the same time as the 3D sampling probe is moved." Independent claims 21 and 24 contain nearly the same identical limitations.

Independent claim 27 requires "repeating the drawing step responsive to movement of the 3D sampling probe(s) within the 3D volume so that as the 3D sampling probe(s) moves through the 3D volume, the image of the 3D sampling probe(s) is redrawn sufficiently fast to be perceived in real time as the 3D sampling probe is moved." Independent claims 47 and 50 contain nearly the same identical limitations.

The Examiner concedes that *Holden* "does not teach the image of the 3D sampling probe(s) is redrawn substantially at the same time as the 3D sampl[ing] probe is moved," which is required by independent claims 1, 21 and 24. Final Office Action, pp. 3, 8. Based on the same reasoning, the Examiner effectively concedes that *Holden* does not teach the image of the 3D sampling probe(s) is redrawn sufficiently fast to be perceived in real time as the 3D sampling probe is moved, which is required by independent claims 27, 47 and 50. Final Office Action, pp. 8-9.

2. **It would not have been obvious to modify *Holden*, as proposed by the Examiner, because TumbleView and GeoSeed teach away from the claimed invention.**

Despite the admitted failure of *Holden* to teach each limitation in the independent claims, the Examiner argues that it would have been obvious to modify *Holden*, based on TumbleView and GeoSeed, in order to supply the missing limitation. The Examiner concludes "it would have been obvious to provide [redraw] the sampling probe at substantially the same time as the [sampling] probe is moved..." Final Office Action, p. 3. The reasons for the Examiner's rejection of independent claims 1, 21, 24, 27, 47 and 50 are the same. Final Office Action, pp. 2-3 and 8-9.

The Examiner refers to a statement in *Holden* describing TumbleView that "more complex volumes require more time to render" and argues that less complex volumes therefore, require less time to render. The Examiner then uses this supposition to conclude that real time speed is obvious due to a reduction of processed data. Final Office Action, p. 3. In support of this conclusion, the Examiner vaguely refers to Applicants' reason for a fast redrawing speed- which is a reduction of processed data. Final Office Action, p.3. The Examiner, however, provides no other analysis, reasoning or support for why a reduction of processed data would render "real time" redrawing of the sampling probe obvious – much less at the time the invention was made in 1998. Although there may be a trade off between processing speed and the amount of processed data, such a trade off probably existed since the advent of computers and does not render real time speed, as claimed for redrawing the image of the sampling probe, obvious at the time the invention was made. Moreover, Applicants' disclosure cannot support the Examiner's conclusion that real time redrawing of the sampling probe, as claimed, was obvious at the time the invention was made. *See KSR*, 127 S.Ct. at 1741 (holding that 'rejections on obviousness grounds cannot be sustained by more conclusory statements; instead, there must be some

articulated reasoning with some rationale underpinning to support the legal conclusion of obviousness"); *and, In re McLaughlin*, 443 F.2d 1392, 1395 (C.C.P.A. 1971) (holding reconstruction based on hindsight may be proper only if it takes into account knowledge which was within the level of ordinary skill in the art at the time the claimed invention was made and does not include knowledge taken only from applicant's disclosure). Regardless, the complete description of TumbleView, which the Examiner conveniently overlooks, teaches away from the claimed invention.

Claim 1 requires "repeating the drawing step responsive to movement of the 3D sampling probe(s) … so that as the 3D sampling probe(s) moves through the 3D volume, the image of the 3D sampling probe(s) is redrawn substantially at the same time as the 3D sampling probe is moved." Conversely, TumbleView is described as a volume with a position that is fixed in space. *Holden*, p. 6-1. According to the description of this feature, one advantage is that a user can tumble the volume on any axis. *Holden*, p. 6-4. While the position of the volume remains fixed in space, the user's perspective or viewpoint of that volume is altered. The TumbleView description therefore, teaches away from a sampling probe, or any other type of subvolume, that is required to move through the 3D volume. *See In re Geisler*, 116 F.3d 1465, 1471(Fed. Cir. 1997) (discussing a *prima facie* case of obviousness can be rebutted by showing that the prior art teaches away from the claimed invention in any material respect); *and*, *Application of Merceir*, 515 F.2d 1161, 1166 (C.C.P.A. 1975) (holding the relevant portions of a reference include not only those teachings which would suggest particular aspects of an invention to one having ordinary skill in the art, but also those teachings which would lead such a person away form the claimed invention). If, however, the TumbleView volume was required to move through the larger 3D volume, as proposed by the Examiner's modification of *Holden*, then the TumbleView

volume would not be fixed in space, as required by the description, and would be rendered unsatisfactory for its intended purpose. *See In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984) (holding modification of prior art, which renders the device unsatisfactory for its intended purpose, effectively establishes the reference teaches away from the proposed modification).

The Examiner also rushed to equate *Holden*'s GeoSeed with the claimed sampling probe in an effort to cobble together enough motivation to modify *Holden* and meet the missing limitation. Final Office Action, p. 3. In particular, the Examiner argues that "the 'sample probe' is interpreted as a position locator which defines the coordinates of a sample within the volume, which is equivalent to Holden's GeoSeed (page 8-16)." *Id.* The Examiner, however, rejected claim 16 on the basis that the claimed seed point, which is a voxel, is described by *Holden* in reference to GeoSeed. Final Office Action, p. 7. Claim 16 further distinguishes a 3D sampling probe from the data set of voxels that define a sampling probe. As described in the application, each voxel is a point within a volume. '980 Application, para. [0043]. Each voxel can also be expressed with a data value, which is a value of some measured attribute or physical parameter at the specified point within the 3D volume. *Id.* GeoSeed similarly describes a seed point, which is simply a voxel. GeoSeed permits the selection (picking) of a seed voxel within a feature of interest and then detects all voxels that 1) are adjacent to the seed voxel or any other detected voxel, and 2) fall within a user-defined range of voxel values or gradient magnitudes. *Holden*, pp. 8-14 and 8-16. *Holden's* GeoSeed therefore, is not equivalent to the claimed sampling probe because a voxel is not a volume – it is a point within a volume. The Examiner's misunderstanding of GeoSeed is highlighted by his use of this feature to reject claim 16, on the basis that GeoSeed describes a seed point, and to reject claim 1, on the basis that GeoSeed describes a sampling probe. To be sure, GeoSeed cannot be both.

The Examiner argues that "[s]ince Holden's disclosure of movement of GeoSeed (page 8-16) is always associated with input from a user, drawing is always associated with providing perception to a user, and concurrency is always described as sufficiently fast to be perceived as real time by the user, the drawing steps are equivalent." Final Office Action, p. 3. The Examiner, however, provides no basis in fact or reasoning to support his position. *See KSR*, 127 S.Ct. at 1741. In fact, there is no reference to "concurrency," "sufficiently fast," or "real time" anywhere in the description of GeoSeed. More importantly, the Examiner's basic misunderstanding of GeoSeed leads to an erroneous assumption that the description of GeoSeed includes some type of movement. GeoSeed detects voxels that are adjacent to the seed voxel or any other detected voxel and fall within a user-defined range of voxel values or gradient magnitudes. *Holden*, p. 8-15. There is no movement of each voxel, as assumed by the Examiner, because each voxel has a fixed coordinate position and a corresponding voxel value within the 3D volume. *Id.* at p. 8-16. Each voxel within the 3D volume can be used to detect and follow a feature of interest within the 3D volume based on its coordinates and voxel value, which is typically used to relate each voxel to the feature of interest. Movement of a voxel to another location would therefore, disrupt the GeoSeed detection algorithm and erroneously associate or disassociate the voxel with the feature of interest based on its voxel value. The GeoSeed description therefore, teaches away from a sampling probe, or any other type of subvolume, that is required to move through the 3D volume. *See In re Geisler*, 1163 F.3d at 1471. In other words, moving a voxel, like the claimed sampling probe, would render an erroneous relationship between the feature of interest and the voxel. *See In re Gordon*, 733 F.2d at 902 (holding modification of prior art, which renders the device unsatisfactory for its intended purpose, effectively establishes the reference teaches away from the proposed modification).

Because *Holden* fails to teach or suggest each element of independent claims 1, 21, 24, 27, 47 and 50, and cannot be modified using TumbleView and GeoSeed as suggested by the Examiner, Applicants respectfully submit that independent claims 1, 21, 24, 27, 47 and 50 are patentable over *Holden*. Claims 2, 4-20, 22-23, 25-26, 28, 30-46, 48-49 and 51-52 are likewise patentable over *Holden* because these claims ultimately depend from independent claims 1, 21, 24, 27, 47 or 50.

D. The Rejection of Claims 3 and 29 Under 35 U.S.C. § 103(a) Should Be Reversed.

Claims 3 and 29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Holden*. Final Office Action, pp. 4, 9.

1. *Holden* does not teach the limitation required by claims 3 and 29.

Claims 3 and 29 require that "the image of the 3D sampling probe(s) is redrawn at a frame rate of at least 10-15 frames per second." The Examiner concedes that *Holden* does not teach this limitation. Final Office Action, pp. 4, 9.

2. It would not have been obvious to modify *Holden*, as proposed by the Examiner, because *Holden*'s video options and animation teach away from the claimed invention.

Despite the admitted failure of *Holden* to teach the limitation in claims 3 and 29, the Examiner basically argues that it would have been obvious to modify *Holden* in order to supply this limitation based on a "video interface for a 'smooth' displaying [that allegedly] indicates the generation of a plurality of frames [of] about 10-15 per second as claimed." *Id*. Although the reason for the Examiner's rejection of claims 3 and 29 is the same, the Examiner fails to reference where *Holden's* "video interface" may be found. *See KSR*, 127 S.Ct. at 1741.

Applicants' have searched all 461 pages in *Holden* for any mention of "video interface" and "smooth" but have been unable to find both in the same passage. A smooth, continuous

rotation of a volume is described, for example, in *Holden* as an animation. *Holden*, p. 10-2. Various video options are also described. *Holden*, p. A-3. An animation is film loop or series of pre-computed views of the volume, each offset by a few degrees. Because the views are all stored together in memory and then projected in rapid sequence on the screen, you do not have to wait for the image to render between each different view (as is the case with TumbleView). *Holden*, p. 10-3. An additional advantage of creating an animation is that you can save it to a disc. *Id.* Presumably, it may also be saved to a videotape recording.

Claims 3 and 29 require the sample probe to be redrawn, which is defined in claim 1 from which it depends. According to claim 1, "redrawn" means repeating the drawing step responsive to movement of the 3D sampling probe(s) within the 3D volume. Further, movement of the 3D sampling probe(s) means a change in shape, size or location of the sampling probe. '980 Application, para. [0052]. An animation or videotape recording of a volume or subvolume is not responsive – it is simply a film loop or series of pre-computed views of the volume. A videotape recording and animation therefore, teach away from what is required by the limitation in claims 3 and 29. *See In re Geisler*, 116 F.3d at 1471.

Because *Holden* fails to teach or suggest each element of claims 3 and 29, and *Holden* cannot be modified using a videotape or animation as suggested by the Examiner, Applicants respectfully submit that claims 3 and 29 are independently patentable over *Holden*.

CONCLUSION

In short, the Examiner's reliance on *Holden* is simply misplaced. Holden, admittedly, fails to teach or suggest each limitation at issue in claims 1, 3, 21, 24, 27, 29, 47 and 50. The Examiner, nevertheless, retreats to isolated descriptions of *Holden* in order to argue that it would have been obvious to modify *Holden* to meet the limitations at issue. One of ordinary skill in the art, however, would not have been motivated to modify TumbleView and GeoSeed, based on the complete description of these features-particularly in a way that would render them unsatisfactory for their intended purpose. *Holden* therefore, teaches away from the limitations in independent claims 1, 21, 24, 27, 47 and 50. One of ordinary skill in the art also would not have been motivated to modify the videotape and animation descriptions in Holden because these descriptions teach away form the limitation in claims 3 and 29.

Accordingly, Applicants respectfully request that the Board reverse the Examiner's rejection of claims 1-52.

Respectfully submitted,

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CERTIFICATE OF TRANSMITTAL

I hereby certify that this correspondence is being filed with the United States Patent and Trademark Office through the EFS-Web Electronic Filing System on the date below:

Date: November 28, 2008 Signature: /Jeannie Harris/
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APPENDIX I (CLAIMS)

1. A program storage device readable by a machine, the device tangibly embodying a program of instructions executable by the machine to perform method steps of imaging a three-dimensional (3D) volume, the method steps comprising:

creating one or more three-dimensional (3D) sampling probe(s), wherein each 3D sampling probe is a sub-volume of the 3D volume;

drawing an image of the 3D sampling probe(s) the image comprising an intersection of the 3D sampling probe(s) and the 3D volume; and

repeating the drawing step responsive to movement of the 3D sampling probe(s) within the 3D volume so that as the 3D sampling probe(s) moves through the 3D volume, the image of the 3D sampling probe(s) is redrawn substantially at the same time as the 3D sampling probe is moved.

2. The program storage device of claim 1, wherein the method steps further comprises:

repeating the drawing step to reshape the 3D sampling probe(s) so that as the 3D sampling probe(s) is changed in shape, the image of the 3D sampling probe(s) is redrawn substantially at the same time;

3. The program storage device of claim 1, wherein the image of the 3D sampling probe(s) is redrawn at a frame rate of at least about 10 to 15 frames per second.

4. The program storage device of claim 1, wherein the drawing step comprises:

extracting from the 3D volume a sub-volume data set corresponding to the surfaces of the 3D sampling probe(s); and

texture mapping the sub-volume data set onto the surfaces of the 3D sampling probe(s).

5. The program storage device of claim 1, wherein the method steps further comprise:

repeating the drawing step to rotate a 3D orientation of the 3D volume and the 3D sampling probe(s) so that as the 3D orientation is changed, the image of the 3D sampling probe(s) is redrawn substantially at the same time.

6. The program storage device of claim 1, wherein the method steps further comprise:

repeating the drawing step to rotate a 3D orientation of the 3D sampling probe(s) independently of a 3D orientation of the 3D volume so that as the 3D orientation of the 3D sampling probe(s) is changed, the image of the 3D sampling probe(s) is redrawn substantially at the same time.

7. The program storage device of claim 2, wherein the method steps further comprise:

repeating the drawing step to rotate a 3D orientation of the 3D volume and the 3D sampling probe(s) so that as the 3D orientation is changed, the image of the 3D sampling probe(s) is redrawn substantially at the same time.

8. The program storage device of claim 2, wherein the method steps further comprise:

repeating the drawing step to rotate a 3D orientation of the 3D sampling probe(s) independently of a 3D orientation of the 3D volume so that as the 3D orientation of the 3D sampling probe(s) is changed, the image of the 3D sampling probe(s) is redrawn substantially at the same time.

9. The program storage device of claim 1, wherein the drawing step comprises:

drawing an image of an intersection of one of the 3D sampling probes with another one of the 3D sampling probes.

10. The program storage device of claim 9, wherein the one of the 3D sampling probe(s) is a data probe and the another one of the 3D sampling probe(s) is a substantially transparent cut probe that cuts out a 3D sub-section of the data probe so that the image of the intersection of the data probate and the cut probe comprises an intersecting surface internal to the data probe.

11. The program storage device of claim 10, wherein the drawing step comprises:

drawing an image of a third 3D sampling probe, wherein the third 3D sampling probe is volume rendered at least partially within the 3D sub-section of the data probe.

12. The program storage device of claim 1, wherein the drawing step comprises:

dividing the image of the 3D sampling probe(s) into a plurality of over-lapping sub-images; and

simultaneously drawing the plurality of over-lapping sub-images, thereby increasing a field-of-view to the user.

13. The program storage device of claim 1, wherein the 3D volume is defined by a data set of voxels, each voxel expressed in the form of x, y, z, data value.

14. The program storage device of claim 13, wherein the data value comprises data selected from the group comprising seismic data, remove sensing data, well log data, gravity and magnetic field data, sidescan sonar image data, temperature, pressure, saturation, reflectivity, acoustical impedance and velocity.

15. The program storage device of claim 13, wherein the drawing step comprises:

extracting from the 3D volume a sub-volume data set corresponding to the 3D sampling probe(s); and

volume rendering the sub-volume data set in accordance with a transparency setting that is a function of each data value, thereby volume imaging the 3D sampling probe(s).

16. The program storage device of claim 13, wherein the method steps further comprise:

identifying a seed point, wherein the seed point is a voxel within the data set of voxels that defines one of the 3D sampling probe(s); and

defining a selection criteria based on the data values, the drawing step being carried out to image selected points only within the 3D sampling probe, wherein the selected points are connected to the seed point, and the data values of the selected points satisfy the selection criteria.

17. The program storage device of claim 16, wherein the 3D sampling probe containing the seed point is an auto picking 3D sampling probe, wherein the repeating step is carried out so that as the auto picking 3D sampling probe moves through the 3D volume, the image of the selected points is redrawn within at least one of the auto picking 3D sampling probe and the 3D volume substantially at the same time.

18. The program storage device of claim 17, wherein the repeating step is carried out so that as the auto picking 3D sampling probe moves through the 3D volume, the image of the selected points is redrawn only within the auto picking 3D sapling probate substantially at the same time.

19. The program device of claim 17, wherein the method steps further comprise:

defining an eraser 3D sampling probe; and

defining a de-selection criteria based on data values, wherein the repeating step is carried out so that as the eraser 3D sampling probe moves through the selected points that

satisfy the de-selection criteria, the selected points that satisfy the de-selection criteria are deleted from the image substantially at the same time.

20. The program storage device of claim 1, wherein the image of the 3D sampling probe(s) is redrawn substantially at the same time as the 3D sampling probe(s) moves through the 3D volume so that a user-selected feature defined by the data values is at least partially visualized.

21. A program storage device readable by a machine, the device tangibly embodying a program of instructions executable by the machine to perform method steps of imaging a three-dimensional (3D) volume, the method steps comprising:

creating a three-dimensional (3D) sampling probe, wherein the 3D sampling probe is a sub-volume of the 3D volume;

drawing an image of at least one of the 3D sampling probe and the 3D volume, the image comprising an intersection of the 3D sampling probe and the 3D volume; and

repeating the drawing step responsive to movement of the 3D sampling probe within the 3D volume so that as the 3D sampling probe moves through the 3D volume, the image of the 3D sampling probe is redrawn substantially at the same time as the 3D sampling probe is moved.

22. The program storage device of Claim 21, wherein the 3D sampling probe is a data probe and the 3D volume is substantially transparent.

23. The program storage device of Claim 21, wherein the 3D sampling probe is a substantially transparent cut probe and the 3D volume comprises a visible data set of voxels, each voxel expressed in the form of x, y, z, data value.

24. A method for imaging a three-dimensional (3D) data volume, the method comprising the steps of:

creating a three-dimensional (3D) sampling probe wherein the 3D sampling probe is a sub-volume of the 3D volume;

drawing an image of at least one of the 3D sampling probe and the 3D volume, the image comprising an intersection of the 3D sampling probe and the 3D volume; and

repeating the drawing step responsive to movement of the 3D sampling probe within the 3D volume so that as the 3D sampling probe moves through the 3D volume, the image of the 3D sampling probe is redrawn substantially at the same time as the 3D sampling probe is moved.

25. The method of claim 24, wherein the 3D sampling probe is a data probe and the 3D volume is substantially transparent.

26. The method of claim 24, wherein the 3D sampling probe is a substantially transparent cut probe and the 3D volume comprises a visible data set of voxels, each voxel expressed in the form of x, y, z, data value.

27. A program storage device readable by a machine, the device tangibly embodying a program of instructions executable by the machine to perform method steps of imaging a three-dimensional (3D) volume, the method steps comprising:

creating one or more three-dimensional (3D) sampling probe(s), wherein each 3D sampling probe is a sub-volume of the 3D volume;

drawing an image of the 3D sampling probe(s), the image comprising an intersection of the 3D sampling probe(s) and the 3D volume; and

repeating the drawing step responsive to movement of the 3D sampling probe(s) within the 3D volume so that as the 3D sampling probe(s) moves through the 3D volume, the image of the 3D sampling probe(s) is redrawn sufficiently fast to be perceived in real time as the 3D sampling probe is moved.

28. The program storage device of claim 27, wherein the method steps further comprise:

repeating the drawing step to reshape the 3D sampling probe(s) so that as the 3D sampling probe(s) is changed in shape, the image of the 3D sampling probe(s) is redrawn in real time.

29. The program storage device of claim 27, wherein the image of the 3D sampling probe(s) is redrawn at a frame rate of at least about 10 to 15 frames per second.

30. The program storage device of claim 27, wherein the drawing step comprises:

extracting from the 3D volume a sub-volume data set corresponding to the surfaces of the 3D sampling probe(s); and

texture mapping the sub-volume data set onto the surfaces of the 3D sampling probe(s).

31. The program storage device of claim 27, wherein the method steps further comprise:

repeating the drawing step to rotate a 3D orientation of the 3D volume and the 3D sampling probe(s) so that as the 3D orientation is changed, the image of the 3D sampling probe(s) is redrawn in real time.

32. The program storage device of claim 27, wherein the method steps further comprise:

repeating the drawing step to rotate a 3D orientation of the 3D sampling probe(s) independently of a 3D orientation of the 3D volume so that as the 3D orientation of the 3D sampling probe(s) is changed, the image of the 3D sampling probe(s) is redrawn in real time.

33. The program storage device of claim 28, wherein the method steps further comprise:

repeating the drawing step to rotate a 3D orientation of the 3D volume and the 3D sampling probe(s) so that as the 3D orientation is changed, the image of the 3D sampling probe(s) is redrawn in real time.

34. The program storage device of claim 28, wherein the method steps further comprise:

repeating the drawing step to rotate a 3D orientation of the 3D sampling probe(s) independently of a 3D orientation of the 3D volume so that as the 3D orientation of the 3D sampling probe(s) is changed, the image of the 3D sampling probe(s) is redrawn in real time.

35. The program storage device of claim 27, wherein the drawing step comprises:

drawing an image of an intersection of one of the 3D sampling probates with another one of the 3D sampling probes.

36. The program storage device of claim 35, wherein the one of the 3D sampling probe(s) is a data probe and the another one of the 3D sampling probe(s) is a substantially transparent cut probe that cuts out a 3D sub-section of the data probe so that the image of the intersection of the data probe and the cut probe comprises an intersecting surface internal to the data probe.

37. The program storage device of claim 36, wherein the drawing step comprises:

drawing an image of a third 3D sampling probe, wherein the third 3D sampling probe is volume rendered at least partially within the 3D sub-section of the data probe.

38. The program storage device of claim 27, wherein the drawing step comprises:

dividing the image of the 3D sampling probe(s) into a plurality of over-lapping sub-images; and

simultaneously drawing the plurality of over-lapping sub-images, thereby increasing a field-of-view to the user.

39. The program storage device of claim 27, wherein the 3D volume is defined by a data set of voxels, each voxel expressed in the form of x, y, z, data value.

40. The program storage device of claim 39, wherein the data value comprises data selected from the group comprising seismic data, remote sensing data, well log data, gravity and magnetic field data, sidescan sonar image data, temperature, pressure, saturation, reflectivity, acoustical impedance and velocity.

41. The program storage device of claim 39, wherein the drawing step comprises:

extracting from the 3D volume a sub-volume data set corresponding to the 3D sampling probe(s); and

volume rendering the sub-volume data set in accordance with a transparency setting that is a function of each data value, thereby volume imaging the 3D sampling probe(s).

42. The program storage device of claim 39, wherein the method steps further comprise:

identifying a seed point, wherein the seed point is a voxel within the data set of voxels that defines one of the 3D sampling probe(s); and

defining a selection criteria based on the data values, the drawing step being carried out to image selected points only within the 3D sampling probe, wherein the selected points are connected to the seed point, and the data values of the selected points satisfy the selection criteria.

43. The program storage device of claim 42, wherein the 3D sampling probe containing the seed point is an auto picking 3D sampling probe, wherein the repeating step is carried out so that as the auto picking 3D sampling probe moves through the 3D volume, the image of the selected points is redrawn within at least one of the auto picking 3D sampling probe and the 3D volume in real time.

44. The program storage device of claim 43, wherein the repeating step is carried out so that as the auto picking 3D sampling probe moves through the 3D volume, the image of the selected points is redrawn only with in the auto picking 3D sampling probe in real time.

45. The program storage device of claim 43, wherein the method steps further comprise:

defining an eraser 3D sampling probe; and

defining a de-selection criteria based on data values, wherein the repeating step is carried out so that as the eraser 3D sampling probe moves through the selected points that satisfy the de-selection criteria, the selected points that satisfy the de-selection criteria are deleted from the image in real time.

46. The program storage device of claim 27, wherein the image of the 3D sampling probe(s) is redrawn in real time as the 3D sampling probe(s) moves through the 3D volume so that a user-selected feature defined by the data values is at least partially visualized.

47. A program storage device readable by a machine, the device tangibly embodying a program of instructions executable by the machine to perform method steps of imaging a three-dimensional (3D) volume, the method steps comprising:

creating a three-dimensional (3D) sampling probe, wherein the 3D sampling probe is a sub-volume of the 3D volume;

drawing an image of at least one of the 3D sampling probe and the 3D volume, the image comprising an intersection of the 3D sampling probe and the 3D volume; and

repeating the drawing step responsive to movement of the 3D sampling probe within the 3D volume so that as the 3D sampling probe moves through the 3D volume, the image of the 3D sampling probe is redrawn sufficiently fast to be perceived in real time as the 3D sampling probe is moved.

48. The program storage device of Claim 47, wherein the 3D sampling probe is a data probe and the 3D volume is substantially transparent.

49. The program storage device of Claim 47, wherein the 3D sampling probe is a substantially transparent cut probe and the 3D volume comprises a visible data set of voxels, each voxel expressed in the form of x, y, z, data value.

50. A method for imaging a three-dimensional (3D) data volume, the method comprising the steps of:

creating a three-dimensional (3D) sampling probe wherein the 3D sampling probe is a sub-volume of the 3D volume;

drawing an image of at least one of the 3D sampling probe and the 3D volume, the image comprising an intersection of the 3D sampling probe and the 3D volume; and

repeating the drawing step responsive to movement of the 3D sampling probe within the 3D volume so that as the 3D sampling probe moves through the 3D volume, the image of the 3D sampling probe is redrawn sufficiently fast to be perceived in real time as the 3D sampling probe is moved.

51. The method of claim 47, wherein the 3D sampling probe is a data probe and the 3D volume is substantially transparent.

52. The method of claim 47, wherein the 3D sampling probe is a substantially transparent cut probe and the 3D volume comprises a visible data set of voxels, each voxel expressed in the form of x, y, z, data value.

APPENDIX II (EVIDENCE)

A complete copy of *Holden* is attached.

APPENDIX III (RELATED PROCEEDINGS)

Because the Examiner in charge of the '635 Application reopened prosecution during the prior appeal, there is no Board decision.